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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appl. No. : 10/694,645 Confirmation No. 4007
Appellant : Timothy M. Morris et al.
Filed : October 27, 2003
TC/A.U. : 3644
Examiner : Tien Quang Dinh

Docket No. : 03-634
Customer No. : 50791

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313

APPEAL BRIEF

Sir:

This is an appeal to the Board of Patent Appeals and Interferences from the final rejection of claims 20 - 27 and 30 - 32, dated May 4, 2005, made by the Primary Examiner in Group Art Unit 3644.

REAL PARTY IN INTEREST

The real party in interest is United Technologies Corporation of Hartford, Connecticut.

RELATED APPEALS AND INTERFERENCES

There are no other prior and pending appeals, interferences or judicial proceedings known to Appellants, Appellants' legal representative, or Assignee which may be related to, directly affect, or be directly affected by or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Claims 20 - 27 and 30 - 32 are pending in the application and are on appeal. Appendix A contains the claims on appeal. Claims 1 - 19, directed to a non-elected invention, have been cancelled and claims 28 and 29 stand withdrawn from consideration.

STATUS OF AMENDMENTS

No amendment was filed subsequent to the final rejection.

SUMMARY OF CLAIMED SUBJECT MATTER

The claims on appeal relate to a system for generating accessory power from a gas turbine engine. See page 1, lines 4 - 5, of the specification. In particular, the invention relates to a hybrid engine accessory power system that enables improved gas turbine engine operability characteristics.

The system (see FIG. 4) comprises means (32) for monitoring at least one parameter which provides information about an incipient change in power demand, means (38) for supplying bleed air from the engine (40) during a transient state in response to the at least one monitored parameter, and a pneumatically operated means (42) for receiving the bleed air and for generating power to operate equipment onboard an aircraft. See page 2, paragraph 0011, of the specification.

As set forth in claim 21, and shown in FIG. 4, the monitoring means comprises an electronic engine control device (32) which receives at least one input signal about the incipient change in power demand (see page 5, lines 1 - 13 of the specification), which electronic engine control device (32), as set forth in claim 22, comprises a full authority digital electronic control device. See page 4, lines 29 - 30, of the specification.

As set forth in claim 23, and shown in FIG. 4, the bleed air supply means comprises a control valve (38) which is opened or modulated by a signal from the electronic engine control device (32). See page 5, lines 14 - 15, of the specification. As set forth in claim 24, the control valve (38) in an open position allows bleed air from a high pressure compressor (90) of the engine (40) to flow to the pneumatically operated means (42). See page 5, lines 15 - 18, of the specification.

Referring now to claim 25, and shown in FIG. 4, the system further comprises a feedback loop (44) for transmitting a signal to the electronic engine control device (32) representative of control valve position. See page 5, lines 18 - 20, of the specification.

As set forth in claim 26, and as shown in FIG. 4, the pneumatically operated means (42) comprises a pneumatically integrated generator (see page 5, line 18 of the specification) for supplying electrical power to operate at least one accessory (48) selected from the group consisting of a generator, a starter/generator, a fuel pump, a deoiler, a PMA, a lube pump, and a hydraulic pump. See page 5, lines 21 - 32 of the specification.

As set forth in claim 27, and as shown in FIG. 4, the pneumatically operated means (42) comprises a pneumatically integrated generator for supplying mechanical power to a gearbox (46) for operating at least one accessory selected from the group consisting of a generator, a starter/generator, a fuel pump, a deoiler, a PMA, a lube pump, and a hydraulic pump. See page 5, lines 21 - 32 of the specification.

As set forth in claim 30, the pneumatically operated means (42) comprises an air turbine connected to a gearbox (46) and further comprising a generator (61) attached to the gearbox and

being driven by the air turbine. See page 7, paragraph 0035 of the specification and FIG 9.

As set forth in claim 31, the pneumatically operated means (42) comprises an air turbine and a generator (61) driven by the air turbine for supplying power to at least one system onboard the aircraft. See page 6, paragraph 0033 of the specification and FIG. 7 of the drawings.

As set forth in claim 32, operation of the pneumatically operated means increases an amount of stall margin available to a high pressure compressor of the engine. See page 4 of the specification, lines 7 - 14 of the specification.

In general, all of the systems of the present invention operated in the following way. During a change in engine steady state, such as deceleration of the engine below a prescribed engine high rotor speed, or during a change in accessory power demand, the control device 32 commands the engine bleed system open. The bleed air is directed to the pneumatically operated device 42 or 42', which in turn produces supplementary accessory drive power, either mechanical or electrical. Once a minimum surge margin point in the acceleration characteristic is passed, the engine bleed system can be closed, thereby improving engine performance. See page 8 of the specification, paragraph 0037.

As a result, a system is provided wherein engine pneumatic power is used to provide power for operating accessories onboard an aircraft, while improving the gas turbine compressor operating line margin from the compressor surge line. In this system, the engine mounted power generation system may operate solely with mechanical power at normal steady state operating conditions and a combination pneumatic and mechanical power during a transient state. See page 3, last line to page 4, line 3 of the specification.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal are as follows:

(1) The rejection of claims 20 - 25 and 32 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,175,701 to Wojciehowski et al. in view of U.S. Patent No. 5,752,379 to Schafer et al.;

(2) The rejection of claims 26, 27, and 30 - 31 under 35 U.S.C. 103(a) as being unpatentable over Wojciehowski et al. in view of Schafer et al. and further in view of alleged admitted prior art on page 5, paragraph 0028, of the specification.

ARGUMENT

(a) Patentability of Independent Claim 20

Claim 20 is the sole independent claim currently pending in the application. It is patentable over the cited and applied prior art for the following reasons.

The present invention is directed to a hybrid mechanical/pneumatic accessory drive system which simultaneously allows for reduced mechanical shaft power load and systems' capacity to absorb and utilize the energy of compressor bleed air at low power. The system of the present invention improves engine transient operation. In the system of the present invention, the engine mounted power generation system may operate solely with mechanical power at normal steady state operating conditions and combination pneumatic and mechanical power during a transient state. As used in this invention, the term "transient state" refers to any change in power demand whether it be a change in engine power demand due to a change in engine state or a change in any mechanical or electrical power

demand due to a change in accessory state. By opening a compressor bleed during a transient state or at any other operating point, the operating line can be lowered, increasing the stall margin (point B in FIG. 1). The bleed air is directed to a pneumatically operated device which reduces demand for mechanical shaft power from the high pressure rotor of the gas turbine engine. Reducing mechanical power demand lowers the compressor operating line, further allowing a given transient excursion with improved stall margin as shown by line 18 in FIG. 1. The prior art cited and applied by the Examiner in rejecting the claims fails to teach or suggest the hybrid mechanical/pneumatic accessory drive system of the present invention.

With respect to the rejection of claim 20, it should be noted that the Wojciehowski et al. reference relied upon by the Examiner broadly describes a means for powering an aircraft spraying system's pumping element with only pneumatic power provided by the main propulsion engine. According to Wojciehowski et al., previous designs had featured elements that "…developed power for the liquid spraying system independent of the engines through a propeller or fan separately exposed to the surrounding airstream." The purpose of the invention in the Wojciehowski et al. patent is "to minimize parasitic load on the aircraft as well as to provide excellent controllability of the rate of spray… ." It alternatively mentions earlier "… in order to minimize parasitic loads upon the aircraft propulsion engine…." The previous designs minimized parasitic load on the engine and improved parasitic drag load on the airplane as described in the second paragraph of the background section in Wojciehowski et al. The Wojciehowski et al. system actually increases parasitic load on the engine and minimizes parasitic drag load on the airplane itself by comparison to referenced

previous designs. Appellants point out the foregoing to demonstrate that Wojciehowski et al. is not directed in any way to the invention described and claimed in independent claim 20.

The Wojciehowski et al. system only describes a means to pneumatically drive a parasitic load device (i.e. a liquid pump). The Wojciehowski et al. system applies specifically to "... agricultural aircraft for spraying of fields and for fire fighting purposes" as described in the background of the reference. There is no mention in Wojciehowski et al. of alternative engine driven means of pump power extraction such as mechanical shaft power or electrical power as a consideration for optimizing the efficiency of the extracted parasitic load. The basic consideration of the Wojciehowski et al. invention is that the engine derived pneumatic power system is a more efficient energy conversion system during periods of high power demand than previously mentioned designs.

The present invention is directed to two key elements not addressed in the Wojciehowski et al. reference. The first is the hybrid nature of the design, simultaneously using engine mechanical shaft and pneumatic power to drive a variety of engine mounted parasitic load devices including fuel pumps, oil pumps, hydraulic pumps, and electrical generators. The reasoning behind the simultaneous use of these two power sources is to actively control the surge margin of the high pressure compressor through the FADEC functions by alternating demand for each source. The present invention focuses on the combined effect of reducing the high compressor operating line by extracting pneumatic bleed power (which moves the operating line away from the surge line) while increasing the surge line (away from the operating line) by reducing the mechanical power demand by the available pneumatic power from the bleed - thus, the hybrid nature of the present invention.

The second important distinction is that the present invention makes no claim of minimizing the parasitic load on either the engine or the airframe. The parasitic load is a function of combined airplane and engine demand for parasitic power, particularly in the low power regime of engine operation (as opposed to the power demand described in the claimed invention). In fact, in certain operating regimes including high power operation of multi-spooled gas turbine engines, pure mechanical shaft power extraction is the most efficient power source for parasitic loads, which the system of the present invention provides for as opposed to the reference's pneumatic only source.

The Wojciehowski et al. patent relied upon by the Examiner shows a system for operating a liquid spray system 40. The system has an engine with a compressor 14. The system further has a pneumatic motor 24 for operating a pump 28. The pneumatic motor 24 has a turbine 26. Bleed air from the compressor 14 flows through a line 22 to operate the turbine 26. A pneumatically operated poppet valve 46 is interposed in the line 22 and is shiftable downwardly from a closed position where the valve 46 completely interrupts pressurized bleed airflow from the engine to the motor 24 to various open positions for regulating the flow rate and pressure of bleed air delivered to motor 24. Modulation of the position of control valve 46 controls the speed of rotation of motor 24 and thus the speed of pump 28 to regulate the rate of flow of liquid being exhausted through nozzles 40.

In operation, the liquid spraying apparatus is initiated by shifting a switch 86 to a start position to energize a solenoid 68 and open a shutoff valve 64 to develop pressure within a chamber 54. Poppet valve 46 then moves to an open position permitting pressurized airflow to drive motor 24 and thus the

pump 28. The operator adjusts the rate of liquid being sprayed by rotating an actuator 76 to adjust the pressure maintained in chamber 54. In this manner, a pressure selector 74 controls the pressure of bleed air flow delivered to turbine motor 24 to control the speed of rotation of the motor and pump and thereby control the rate of liquid exhaust through the spray boom.

Wojciehowski et al. system lacks any means for monitoring at least one parameter which provides information about an incipient change in power demand. The system also lacks any means for supplying bleed air from the engine during a transient state *in response to* the at least one monitored parameter. The only thing that the Wojciehowski et al. system has is a pneumatically operated means (the drive motor 24) for receiving bleed air and for generating power to operate equipment (the pump 28) onboard an aircraft. In order to operate this system, as demonstrated by Wojciehowski et al., there is no need for the claimed monitoring means and/or the claimed means for supplying bleed air from the engine during a transient state *in response to said at least one monitored parameter*. The point which the Examiner seems to miss is that there is absolutely no reason or need to provide Wojciehowski et al.'s system with either of the claimed means since such means serve no useful purpose or benefit in the Wojciehowski et al. system. Appellant has argued this point with the Examiner and the Examiner has never provided any reason or explanation as to why Wojciehowski et al. would be motivated to have the claimed monitoring means and/or the claimed bleed air supplying means and/or how the inclusion of such means would improve the operation of the Wojciehowski et al. system.

The Examiner attempts to piece an obviousness rejection together through the citation of the Schafer et al. patent. However, this patchwork rejection fails for a number of reasons.

First, the Schafer et al. patent merely describes the function of a modern FADEC engine control system function in a *post surge recovery regime*. The Schafer et al. patent does not teach or suggest how one would use a FADEC during normal engine operation, which is by definition prior to surge. Second, there is absolutely no reason why one of ordinary skill in the art would be motivated to include a FADEC such as Schafer et al.'s system in Wojciehowski et al.'s system. The FADEC would serve absolutely no purpose with regard to the operation of the liquid spraying system which is the focus of Wojciehowski et al. Thus, the prior as a whole does not suggest the desirability of the combination. Therefore, the obviousness rejection fails. See *in re Beattie*, 974 F.2d 1309, 1311, 24 USPQ2d 1040 (Fed. Cir. 1992).

With regard to the Examiner's contention that it would be obvious to modify Wojciehowski et al. by Schafer et al. to safely and efficiently generate power to operate the aircraft equipment, even if this statement were true, there still is no teaching or suggestion in the references of any means for monitoring at least one parameter which provides information about an incipient change in power demand and means for supplying bleed air from the engine during a transient state *in response to said at least one monitored parameter*. No such means is discussed in either of the cited and applied references. Thus, even if the references were combinable, they would not meet all the limitations of the claims.

The basic infirmity in the Examiner's position is best demonstrated by the statement on page 4, lines 12 - 13, that "[t]he examiner did not suggest using Schafer et al.'s system directly into Wojciehowski et al.'s system." If the Examiner is not incorporating Schafer et al.'s system directly into Wojciehowski et al.'s system, the obviousness rejection fails

because there is no basis for the combination of references. Claim 20 as written clearly ties the monitoring means and the bleed air supplying means to the operation of the pneumatically operated means. If the purpose of the citation of references is merely to show that components of a system are known in the art, then the Examiner misses the key point of an obviousness rejection - namely, that there has to be some teaching, suggestion, or motivation to combine the references.

Further, with regard to Schafer et al., the Examiner is wrong when he says that the FADEC is used to monitor at least one parameter which provides information about an incipient change in power demand. Schafer et al. is clear (see column 2, lines 25 et seq.) that the fuel control 12 (which includes the FADEC) responds to power requests manifested by the position produced from a power level control 16. Thus, the fuel control 12 in Schafer et al. is not monitoring any parameter from the power level control. Rather, it is operating in response to the input from the power level control.

Still further, even if one could somehow say that the fuel control 12 was monitoring such a parameter, there is nothing in Schafer et al. which says that there is any means for supplying bleed air from the engine during a transient state in response to the at least one monitored parameter.

The Examiner appears to miss the point that the Schafer et al. system is not intended to monitor parameters about incipient changes in power demand. It is designed to sense surge conditions and prompt tests for a change in exhaust temperature elevation and to determine if N2 is less than idle.

Appellants submit that the Examiner has failed to make out a *prima facie* case of obviousness for the subject matter of claim 20. There is no teaching or suggestion in the references which would lead one to combine the references in the manner

cited by the Examiner. Further, there is no motivation which would lead one of ordinary skill in the art to combine the references in the manner suggested by the Examiner. One is for the operation of a liquid spraying system and the other is for a surge detection system. Appellants submit that someone looking to improve a liquid spraying system such as Wojciehowski et al.'s would not look to Schafer et al. and someone looking to improve a surge detection system such as Schafer et al.'s would not look to Wojciehowski et al. Finally even if one could find a reason to combine the references, neither one teaches or suggests a "means for supplying bleed air from the engine during a transient state in response to said at least one monitored parameter." For the reasons stated hereinbefore, the subject matter of claim 20 is patentable over the cited and applied references.

(b) Patentability of Claims

21 - 25 and 32

Claims 21 - 25 and 32 all depend directly or indirectly from claim 20. Thus, at a minimum, these claims are allowable for the same reasons that claim 20 is allowable.

Claim 21 is allowable because neither Wojciehowski et al. nor Schafer et al. has a monitoring means comprising an electronic engine control device which receives at least one input signal about said incipient change in power demand. The Examiner has failed to describe any monitoring means in Schafer et al. which receives at least one input signal about the incipient change in power demand. As previously noted, Schafer et al. does not monitor the input from the control lever 16. It acts in response thereto. Thus, neither reference renders the claimed subject matter obvious.

Claim 22 is allowable for the same reasons as claims 20 and 21. While Schafer et al. may disclose a FADEC, it is submitted that the FADEC is used in a different manner for different purposes.

Claim 23 is allowable because neither reference teaches or suggests a control valve which is opened or modulated by a signal from the electronic engine control device. In Wojciehowski et al., the control valve is not opened or modulated by a signal from an electronic engine control device. In fact, the control devices have nothing to do with engine operation at all. There is no discussion of any control valve in Schafer et al. for use in a bleed air supply means.

Claim 24 is allowable because neither reference teaches or suggests a control valve which in an open position allows bleed air from a *high pressure compressor* of an engine to flow to the pneumatically operated means. While Wojciehowski et al. has a control valve, it lacks a high pressure compressor which is a term that has significance in the art.

Claim 25 is allowable because neither reference teaches or suggests a feedback loop for transmitting a signal to the electronic control device representative of control valve position. Wojciehowski et al. lacks both the claimed feedback loop and t he claimed electronic control device. Schafer et al. may have feedback loops, but there is no disclosure of any of them transmitting a signal representative of a control valve position.

Claim 32 is allowable because the pneumatically operated means in Wojciehowski et al. is a pneumatic motor which is completely independent of engine operation. Its use has no effect on engine operation. Thus, the pneumatically operated means in Wojciehowski will not in any way increase the amount of stall margin available to a high pressure compressor of the

engine. With regard to the inherency argument made by the Examiner in connection with claim 32, the Examiner has not presented any convincing line of reasoning as to why this is the case. First Wojciehowski et al.'s engine lacks a high pressure compressor. Second, there is absolutely no reason why the pneumatic motor in Wojciehowski et al. increases the amount of stall margin available to a high pressure compressor of the engine. All that happens in Wojciehowski et al is that bleed air from the engine is either supplied or not supplied to the pneumatic motor. It is submitted that this has no effect on the stall margin of the engine.

For these reasons, claims 21 - 25 and 32 are allowable over the combination of Wojciehowski et al. and Schafer et al.

(c) Patentability of Claims
26, 27, 30 and 31

Claims 26, 27, 30 and 31 depend from claim 20 and at a minimum are allowable for the same reasons as claim 20.

The rejection of these claims depends on the combination of Wokciehowski et al. and Schafer et al. The Examiner then goes on to argue that since pneumatically integrated generators that supply electrical and mechanical powers are well known in the art that it would be obvious to one of ordinary skill in the art to use additional pneumatically integrated generators in Wojciehowski et al.'s system to generate power for other accessories. The rejection lacks any statement as to what would motivate one of ordinary skill in the art having Wojciehowski et al. and Schafer et al. before them to add the features claimed in claims 26, 27, 30, and 31. The Examiner contends that one would do it to generate power for other accessories; however,

neither Wojciehowski et al. nor Schafer et al. discloses such other accessories.

The Examiner seems to miss the point that the mere fact that things in the prior art could be used in a prior art system does not establish obviousness absent some teaching, suggestion, or motivation to do so. Appellants acknowledge that none of the pneumatic means need to be used to operate the liquid spraying system in Wojciehowski et al. Given this fact, there is no reason why one of ordinary skill in the art would be motivated to incorporate them into Wojciehowski et al.

The rejection of claims 26, 27, 30, and 31 is ill conceived. The only thing that the Examiner has shown is that certain individual claimed features by themselves are old in the art. Something being old in the art is not a sufficient basis to form an obviousness rejection. More is needed - a teaching, a suggestion, or motivation which flows from the references. See *In re Rouffet*, 149 F3d. 1350, 1355, 47 USPQ2d 1453, 1457 - 58 (Fed. Cir. 1988).

Appellants submit that there is absolutely no reason to provide Wojciehowski et al.'s system with the pneumatically integrated generator of claims 26 and 27 for operating the equipment set forth in claims 26 and 27 and/or the turbine connected to the gearbox and the generator attached to the gearbox and being driven by the air turbine of claim 30 and/or the air turbine and the generator driven by the air turbine for supplying power to at least one system onboard an aircraft of claim 31. None of these claimed features are needed to operate or improve the operation of the liquid spraying system of Wojciehowski et al. In fact, they would serve no purpose with regard to the operation of the liquid spraying system.

For these reasons, claims 26, 27, 30 and 31 are clearly patentable over the combination of references and the alleged admitted prior art.

CONCLUSION

For the foregoing reasons, the Board is hereby requested to reverse the rejection of claims 20 - 27 and 30 - 32 and remand the application to the Primary Examiner for allowance and issuance.

FEES

A check in the amount of $500.00 to cover the cost of the Appeal Brief fee is enclosed. Should the Director determine that an additional fee is due, he is hereby authorized to charge said fee to said Deposit Account.

Respectfully submitted,

Timothy M. Morris et al.

By _____

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IN TRIPLICATE

Date: October 3, 2005

I, Nicole Motzer, hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313" on **October 3, 2005**.

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APPENDIX A - CLAIMS ON APPEAL

20. A system for generating accessory power from a gas turbine engine, said system comprising:

means for monitoring at least one parameter which provides information about an incipient change in power demand;

means for supplying bleed air from said engine during a transient state in response to said at least one monitored parameter; and

a pneumatically operated means for receiving said bleed air and for generating power to operate equipment onboard an aircraft.

21. A system according to claim 20, wherein said monitoring means comprises an electronic engine control device which receives at least one input signal about said incipient change in power demand.

22. A system according to claim 21, wherein said electronic engine control device comprises a full authority digital electronic control device.

23. A system according to claim 21, wherein said bleed air supply means comprises a control valve which is opened or modulated by a signal from said electronic engine control device.

24. A system according to claim 23, wherein said control valve in an open position allows bleed air from a high pressure

compressor of said engine to flow to said pneumatically operated means.

25. A system according to claim 23, further comprising a feedback loop for transmitting a signal to said electronic engine control device representative of control valve position.

26. A system according to claim 20, wherein said pneumatically operated means comprises a pneumatically integrated generator for supplying electrical power to operate at least one accessory selected from the group consisting of a generator, a starter/generator, a fuel pump, a deoiler, a PMA, a lube pump, and a hydraulic pump.

27. A system according to claim 20, wherein said pneumatically operated means comprises a pneumatically integrated generator for supplying mechanical power to a gearbox for operating at least one accessory selected from the group consisting of a generator, a starter/generator, a fuel pump, a deoiler, a PMA, a lube pump, and a hydraulic pump.

30. A system according to claim 20, wherein said pneumatically operated means comprises an air turbine connected to a gearbox and further comprising a generator attached to said gearbox and being driven by said air turbine.

31. A system according to claim 20, wherein said pneumatically operated means comprises an air turbine and further comprising a generator driven by said air turbine for supplying power to at least one system onboard an aircraft.

32. A system according to claim 20, wherein operation of said pneumatically operated means increases an amount of stall margin available to a high pressure compressor of said engine.

APPENDIX B

NOT APPLICABLE

APPENDIX C

NOT APPLICABLE